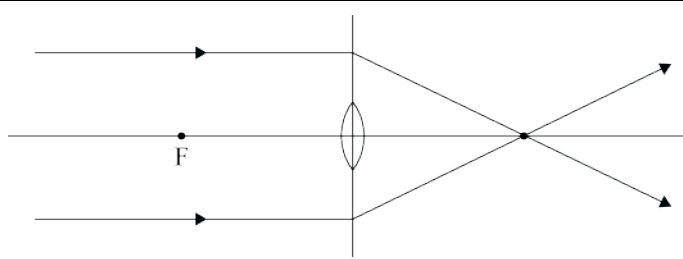
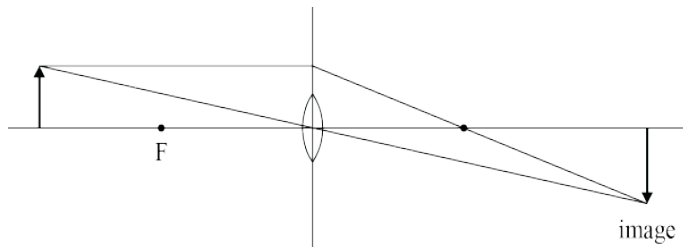


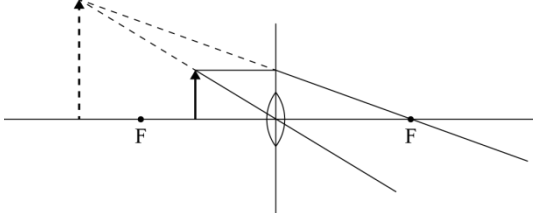
Assessment Schedule – 2014

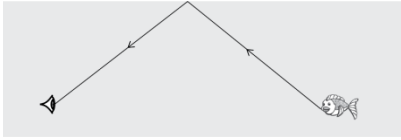
Physics: Demonstrate understanding of waves (91170)

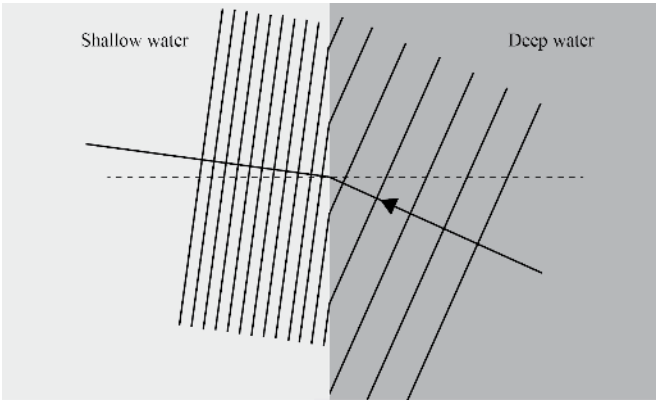
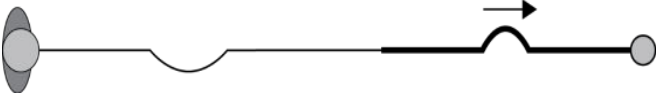
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	2m + 1a	2m + 2a	2m + 1e	1e + 2m + 1a

Other combinations are also possible using **a = 1, m = 2 and e = 3**. However, for M5 or M6 at least one Merit question needs to be correct (maximum 6). For E7 or E8 at least one Excellence needs to be correct (maximum 8).

Question	Evidence Statement	Achievement	Merit	Excellence
ONE (a)		Correct answer.		
(b)	 <p>Real image.</p>	One ray and nature OR two rays.	Correct diagram AND Nature.	
(c)	$d_i = 5.5 \quad h_i = 1.5 \quad f = 5.0$ $\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$ $\frac{1}{5.0} = \frac{1}{5.5} + \frac{1}{d_o}$ $\frac{1}{d_o} = 0.018$ $d_o = 55 \text{ cm}$ $\frac{h_i}{h_o} = \frac{d_i}{d_o}$ $\frac{1.5}{h_o} = \frac{5.5}{55}$ $h = 15 \text{ cm}$	Correct formula and substitution.	Correct object distance.	Correct mathematical calculation and answer.

<p>(d)</p>	 <p>When the object is closer than 5 cm from the lens, it is inside the focal point. The image produced is virtual (and hence cannot be projected on the film). The rays diverge on passing through the lens do not focus on the film so no picture formed.</p>	<p>Correct diagram. OR Explanation.</p>	<p>Correct diagram. AND Explanation</p>	<p>Correct diagram. AND A full explanation that links to why no picture image on film.</p>
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Question	Evidence Statement	Achievement	Merit	Excellence
TWO (a)	Total internal reflection.	Correct answer		
		Correct ray diagram (not 90°).		
(b)	$n_1 \sin \theta_1 = n_2 \sin \theta_2$ $n_1 \sin 47^\circ = 1.0 \sin 90^\circ$ $n_1 = \frac{1}{\sin 47^\circ} = 1.367$ $n_1 = 1.4$	Correct formula and substitution incorrect answer.	Correct mathematical calculation and answer.	
(c)	$\frac{n_1}{n_2} = \frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1}$ $\frac{1.0}{1.367} = \frac{\lambda_2}{6.5 \times 10^{-7}}$ $\lambda_2 = \frac{6.5 \times 10^{-7}}{1.367} \quad \text{NB Cons. error}$ $\lambda_2 = 4.76 \times 10^{-7} \text{ m}$ $f = \frac{v}{\lambda} = \frac{3.0 \times 10^8}{6.5 \times 10^{-7}}$ $f = 4.6 \times 10^{14} \text{ Hz}$	Correct wavelength. OR Frequency.	Correct wavelength. AND Frequency.	
(d)	Sound waves have longer wavelengths compared to light waves. Due to the longer wavelength, sound waves can diffract through the open door (same order of size as λ_{sound}). Light cannot diffract as much as sound. Hence Moana cannot see the radio, but can hear it.	ONE correct idea.	Links the concept of diffraction along with one difference stated.	Is able to point out one difference between light and sound waves. AND Is aware about the concept of diffraction in this example. AND Can reason why sound waves reach Moana, but light waves cannot reach her.

Question	Evidence Statement	Achievement	Merit	Excellence
THREE (a)	$v = f\lambda$ $f = \frac{v}{\lambda} = \frac{0.5}{1.2} = 0.42 \text{ Hz}$ (NB 0.50/1.2 2sf)	$\frac{0.5}{1.2} = 0.42 \text{ Hz}$ (0.42 s ⁻¹)		
	2 sig fig.	Correct unit and sig fig.		
(b)	$v = f\lambda$ $\lambda = \frac{v}{f} = \frac{0.80}{1} = 0.80 \text{ m}$ path difference = 2.0 – 1.6 = 0.4 m This is half a wavelength so the point X must be a node. (The waves arrive out of phase hence there is destructive interference creating a node.)	X is a node / destructive interference. OR Correct wavelength.	Correct wavelength. AND Node OR path difference.	Correct answer relating path difference to wavelength and node produced.
(c)		Smaller wavelength OR correct direction (At right angles to each other.)	Smaller wavelength AND correct direction.	
(d)	Pulse is inverted – reflects off a fast slow interface (light-heavy; fixed.) (Pulse travels further in fast light spring in same time.) 	Correct diagram with inverted pulse and further along than reflected pulse. OR Explanation for inverted pulse.	Correct diagram. AND Explanation for inverted pulse.	

Cut Scores

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 7	8 – 14	15 – 20	21 – 24